

January 23, 2003

TO: Internal File

FROM: James D. Smith, Senior Environmental Scientist, Team Lead

RE: Mill Fork Lease Extension of the Deer Creek Mine, Energy West Mining, PacifiCorp, Deer Creek Mine, C/015/018-PM01I-2

SUMMARY:

The Mill Fork Lease (Utah State Lease ML-48258) adds approximately 5,563 acres to the Deer Creek Mine permit area, bringing total acreage to approximately 24, 500 acres. Energy West acquired the lease on April 12, 1999. The Permit Application Package (PAP) to add the Mill Fork Lease to the Deer Creek permit was received by the Division on October 10, 2001. This PAP is formatted to be added as Volume 12 of the Deer Creek Mine MRP.

TA C/015/018-PM01I, sent to the operator in January 2002, identified numerous deficiencies. The operator's response to that TA was received April 18, 2002, and this technical memorandum applies to that response.

Entry to the Mill Fork Lease from the existing permit area will be by entries in the Hiawatha Seam, advanced from the current permit area by way of Lease Modification #3, a 65.7-acre area that has been added to Lease U-06039 for this purpose. The only potential surface facility associated with this Mill Fork Lease permit extension is the possible ventilation breakout in Crandall Canyon, upstream of the existing Crandall Canyon Mine. The need for these portals will be evaluated and the design will be made based on future coal exploration. If these portals are needed, they will be permitted in a separate application. All currently planned coal mine operations in the Mill Fork Lease will be underground.

Coal will be mined in both the Blind Canyon and Hiawatha Seams. The Blind Canyon is to be mined first, accessed from the Hiawatha through rock slopes that are to be built within the Mill Fork Lease area. Total cumulative vertical extraction from both seams will not exceed 20 feet. The full extraction methods to be used are anticipated to cause subsidence that can be planned and controlled. The PAP refers to data in Annual Reports and other sources for the required information for adequate and complete baseline water-quantity and -quality data.

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Because of recent changes regarding water replacement in the Coal Mining Rules, a new deficiency requiring a plan for replacement of water supplies was included in TA C/015/018-PM01I-1, dated October 9, 2002. The response to that TA was received by the Division on December 4, 2002.

TECHNICAL ANALYSIS:

ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: Pub. L 95-87 Sections 507(b), 508(a), and 516(b); 30 CFR 783., et. al.

GENERAL

Regulatory Reference: 30 CFR 783.12; R645-301-411, -301-521, -301-721.

Analysis:

The application for the proposed Mill Fork Lease area contains a description of the existing, pre-mining environmental resources within the proposed permit area and adjacent areas that may be affected or impacted by the proposed underground mining activities.

Findings:

General Environmental Resources Information is adequate to meet the requirements of the Coal Mining Rules.

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-724.

Analysis:

Appendix A of the Mill Fork Lease PAP Hydrology section an update of the current monitoring plan in Volume 9 of the Deer Creek, Des-Bee-Dove, Cottonwood-Wilberg PAP. Appendix B is a report by Mayo and Associates, *Surface-water and ground-water investigation of the Mill Fork Lease area, Emery County, Utah*, which includes a PHC determination.

Appendix C to the Mill Fork Lease PAP has been submitted with information on springs and seeps in the Mill Fork Lease. There is a very useful section with photos and descriptions of

the sites; details on location and elevation, geology and stratigraphic position, and water rights and development information; relationships to other springs; and a determination of the probable recharge area. This appendix also contains data report sheets for select seeps and springs – including isotope data for select springs, and water rights in the Mill Fork Lease area. Other baseline information for the Mill Fork Lease is in the main section of the PAP; and some is in the Annual Reports.

Jointing, which affects hydrologic characteristics, is significant in the rocks of the Mill Fork Lease area. The dominant joints in the area parallel the Joes Valley Fault, trending predominantly north-south to north 10^0 east, and a few secondary fracture sets follow other orientations (R845-301-624). Geology is described in R645-301-600-Geology of the Mill Fork Lease PAP, and because geology relates to ground and surface water, it is further discussed in R645-310-700-Hydrology.

Water Replacement

Because of recent changes regarding water replacement in the Coal Mining Rules, a deficiency requiring a plan for replacement of water supplies was included in an earlier technical analysis. As defined in R645-301-100 of the Coal Mining Rules,

“Water Supply”, “State-appropriated Water”, and “State-appropriated Water Supply” are all synonymous terms and mean, for the purposes of the R645 Rules, state appropriated water rights which are recognized by the Utah Constitution or Utah Code.

Under rule R645-301-525.400, if the Division determines that subsidence could adversely affect state-appropriated water supplies through damage, diminution in value or foreseeable use; or that contamination, diminution, or interruption could occur, the application must include a subsidence control plan that contains information in accordance with:

R645-301-525.400 ... measures to be taken in accordance with R645-301-731.530 and R645-301- 525.500 to replace adversely affected State-appropriated water supplies

R645-301-525.480. A description of the measures to be taken in accordance with R645-301-731.530 and R645-301- 525.500 to replace adversely affected State-appropriated water supplies ...

R645-301-731.530. State-appropriated water supply. The permittee will promptly replace any State-appropriated water supply that is contaminated, diminished or interrupted by UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES conducted after October 24, 1992, if the affected water supply was in existence before the date the Division received the permit application for the activities causing the loss, contamination or interruption. The baseline hydrologic

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and geologic information required in R645-301-700. will be used to determine the impact of mining activities upon the water supply.

The probability of subsidence causing such impacts or adverse affects in and adjacent to the Mill Fork Lease is small (PAP, section R645-301-728, E.; and R645-301-728, I. 2.), but because a possibility exists, the water replacement rules apply.

Little Bear Spring is of particular concern. Direct impacts are not likely, but the primary source of recharge to this spring is the runoff from upper Mill Fork Canyon, which flows to Little Bear Spring by way of the creek in Mill Fork Canyon and the Mill Fork Graben. The report by Mayo and Associates in Appendix B (PAP, section R645-301-700) concludes that Mill Fork is the primary source of recharge to Little Bear Spring. (Based on an AquaTrack™ survey that is not cited in the PAP, it has been estimated that 60 to 70 percent of the Little Bear Spring discharge comes from upper Mill Fork Canyon through Mill Fork Graben.)

Between Mill Fork and Little Bear Canyons, the down-plunge end of the Crandall Canyon Syncline intercepts the Mill Fork Graben and may provide part of the recharge to Little Bear Spring. When operations in the Trail Mountain Mine exposed the Spring Canyon Member in the down-plunge end of the Straight Canyon Syncline, ground water under pressure entered the mine at a rate of 200 to 300 gpm until the Spring Canyon Member was depressurized (PAP, section R645-301-700, Appendix B, page 72). The possibility exists that mining in the Mill Fork tract could depressurize the water in this syncline and impact some portion of the flow at Little Bear Spring. Exploration boreholes along the trough of the Crandall Canyon Syncline did not have measurable ground-water inflow from the Blackhawk Formation and Star Point Sandstone. The Crandall Canyon Syncline, and the potential that mining in this syncline will impact the hydrologic balance in and adjacent to the Mill Fork Lease, Little Bear Spring in particular, are discussed in the PHC in section R645-301-728, I. 1. The potential for impact is very low.

Subsidence could intercept or interrupt flow from upper Mill Fork Canyon, where precipitation and runoff are greatest, and produce a proportional decrease in the flow at Little Bear Spring (PAP, section R645-301-700, Appendix B, page 127). Going on the basis that 65 percent of Little Bear Spring flow is from Mill Fork, then a 20 to 25 percent reduction of flow in Mill Fork could produce a reduction of flow at Little Bear Spring on the order of 10 to 15 percent. The potential for interception of ground-water flow by subsidence is also low.

Because possible impacts to Little Bear Spring exist, areas within the Mill Fork tract are “renewable resource land” under the Coal Mining Rules and subject to specific regulations and protection. There are also other State-appropriated water supplies in and adjacent to the Mill Fork Lease, identified in R645-301-600, Appendix C of the PAP, covered by the same water replacement regulations. Replacement of State-appropriated water supplies is discussed briefly in section 731.530, which refers to Table MFHT-2. Table MFHT-2 lists:

- Surface- and ground-water rights within and adjacent to the Mill Fork Lease;

- The name associated with the spring or stream/drainage;
- The location of the water right;
- What development has been done;
- Ownership;
- The amount of water claimed in the water right;
- The amount of water documented by the Permittee with baseline data;
- Water-rights shares owned by PacifiCorp that could be used for water replacement;
- Specific steps listed under Mitigation Review that will be followed as part of the process to determine if remediation is needed, including annual consultation with the water-right owners; and
- Specific steps listed under Mitigation Alternatives that will be implemented if replacement becomes necessary:
 - Rehabilitate the spring source using BTCA;
 - Transfer water rights to adjacent ground-water sources (refer to Map MFS1832D for locations of water rights);
 - Establish permanent ground-water collection and distribution systems, i. e., Guzzlers; and
 - For Little Bear Spring, negotiate a mitigation agreement.

These constitute a plan sufficient to satisfy the water replacement requirements in the Coal Mining Rules; however, three items need to be clarified:

- Indicate whether the first part of the paragraph of section 731.530 is merely a verbatim restatement of Coal Mining Rule R645-301-731.50 or is a commitment from the Permittee to comply with that rule;
- In section 731.530, the word “potential” needs to be removed from the next-to-last sentence - “In addition, Table MFHT-2 list the quantity of the water rights within the projected area, and observed flows collected during the baseline surveys and potential mitigation alternatives.”: these are not “potential” alternatives, these will now become the core of the Permittee’s water-replacement plan. The Permittee will be expected to be prepared to implement, if necessary, one or more of the listed Mitigation Alternatives (mitigation methods not listed might be acceptable but would need to be agreed to by the Division and the owner of the affected water right); and
- The water replacement information in section 731.530 and Table MFHT-2 needs to be linked to Coal Mining Rule R645-301-525.480 in the engineering section, the rule that requires description of the measures to be taken to replace adversely affected State-appropriated water.

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Baseline Information

Ground-water Information

Although some (for example *Lines, G. C., 1985, The ground-water system and possible effects of underground coal mining in the Trail Mountain area, central Utah, USGS Water-Supply Paper 2259*) describe the Blackhawk and Star Point strata as a regional aquifer, water intercepted in the Deer Creek and Cottonwood/Wilberg Mine workings is usually perched water from tabular or stream-channel sandstones that have moderate porosity but low permeability and poor interconnectivity. A potentiometric surface can be mapped in the Spring Canyon Member of the Star Point Sandstone in the Mill Fork tract (PAP, Figure MFHF-6), but as with other units of the Star Point, this unit generally has low permeability and produces water only where permeability has been enhanced by fracturing, erosion, or weathering (PAP, section R645-301-721, A. 3. f.); however, MW-1 at the Crandall Canyon Mine flows 0.5 to 1 gpm from apparently unfractured Star Point Sandstone, from a zone noted by the driller as being coarser-grained than the rest of the unit (Crandall Canyon Mine MRP, p. 7-7). Water is also encountered in open joint-systems in these rocks, in some fault zones - mainly the Roan Canyon fault zone, and the Straight Canyon Syncline (PAP, section R645-301-624).

The North Horn and Price River Formations also contain localized, perched water tables or saturated zones (PAP, section R645-301-721, A. 3.), although the Price River Formation is generally devoid of water because of a lack of recharge (PAP, section R645-301-721, A. 3. c.).

The locations of known seeps and springs within the Mill Fork Lease area are shown on the Pre-Subsidence Survey Map (MFS1839D). Ground-water rights are described in some detail at R645-301-721, A. 15 of the PAP. No wells with water rights are mentioned, and the Division has no knowledge of water wells or ground-water resources other than seeps and springs in this area.

Reports covering field parameters go back to 1980 for a few springs. A summary of historic water-quality data for the area, mainly collected for the NEPA analysis process prior to leasing of the coal, is in Appendix C of section R645-301-700.

In the past, PacifiCorp collected water-monitoring data at high-flow (May or June) and low-flow (August, September, or October). Under existing mine permits, operational ground-water samples at springs are collected during July and October: baseline data collection for the Mill Fork Lease has generally followed the same schedule. Laboratory reports for 39 seeps and springs from the 3rd and 4th quarter 2000 are in Appendix C of the PAP: this includes EM POND, a spring fed pond used by cattle and wildlife. Reports for 53 seeps and springs from the 2nd, 3rd, and 4th quarters 2001 are also in Volume 12. Altogether, 30 seeps and springs were sampled more than once during the two-year period, and 10 were sampled three times. Baseline monitoring continued during 2002.

Baseline data in the PAP for the 20 springs that are to be added to the operational monitoring are summarized in Table TM-1 below. Criteria used to select these springs are listed in Section R645-301-20 A. of the MRP. Water users and the USFS were also consulted on the selection.

Three of the springs selected for monitoring have only limited baseline data. Springs RR-5 and MF-19B had only field parameters until water quality data were obtained at both springs in July 2002. (Information that the Permittee considers representative was obtained at adjacent springs: MF-18B, adjacent to MF-19B, was sampled for water quality in October 2000; and RR-6 and RR-7A, adjacent to RR-5, were sampled during 2001 high-flow because the water at RR-5 was too high in suspended solids.) At spring EM-216, field parameters were collected during the initial quarter of baseline data collection and there have been no further baseline data collected for this spring because of low flows or high suspended solids in the water (July 2001).

Of the other 17 springs, 2 have had water quality determined by lab analyses for one quarter only, 7 had it determined for two quarters, and 6 had it determined for three quarters during the 2000-2001 baseline data collection period; however, additional baseline data were collected during 2002. Baseline data submitted with the PAP meet the minimum standard in directive Tech 004 that the Division needs one-year of baseline data to initiate a Technical Analysis and two years of baseline data sufficient to determine seasonal water quality and quantity. There are no baseline data for Grants Spring because it was added, at the request of the USFS, after the baseline-monitoring program was completed, and baseline data for Little Bear Spring consist of the annual water-quality analyses done for CVSSD.

According to the table in section R645-731-200 A. 1. of the PAP, there are water rights on 8 of the 20 springs that are to be monitored. Of the 8 springs with water rights that are to be monitored, EM-216 has no water-quality data (see Table TM-1 below). There was measurable flow at EM-216 only once during the 2000- 2002 period, and a water-quality sample was not taken that time because of high suspended solids in the water.

R645-301-525.130 of the Coal Mining Rules requires a survey of the quality and quantity of all state appropriated water supplies in the permit and adjacent area that could be contaminated, diminished, or interrupted by subsidence. All springs with water rights that are located within the permit and adjacent area have at least one flow measurement, and most have pH and TDS or electric conductivity measurements. Printouts of water-rights information from the Division of Water Rights are in Appendix C: these provide the information on quality and quantity needed for the pre-subsidence survey. This water-rights information will determine the quality and quantity to be replaced under Water Replacement Rules unless the Permittee collects baseline data at the water-right points of diversion: baseline data collected for water quantity should be correlated to variations in precipitation, if possible.

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Nine of the springs in the area that have water rights (PAP, section R645-301-700, Table MFHT-2) are not being proposed for operational monitoring (see Table TM-2 below). Information on why these springs do not have baseline and why they will not be monitored was included in the cover-letter sent with the April 18, 2002 submittal: the springs with water rights that are not being proposed for monitoring are either outside both the permit area and the area where the Permittee expects impacts (JV-26, JV-36, and JV-43), or within the permit area but outside the area where the Permittee expects impacts (RR-14A, UJV-204, UJV-207, UJV-209A, UJV-213, and UJV-214). Criteria used to select these springs for monitoring is tabulated in Section R645-301-20 A. of the MRP. Water users and the USFS were also consulted on the selection, and Grants Spring was added to the monitoring program at the request of the USFS.

Genwal conducted a baseline spring and seep survey in 1994, 1995, and 1996 in the Mill Fork lease-by-application (LBA) tract to meet NEPA requirements (the northern portion of the tract had been surveyed in 1989 and 1990). The connection between these data and the pre-lease hydrology evaluation for the USFS by Genwal is briefly explained in section R645-301-721, A. 4 of the PAP. The USFS determined these Genwal data met Data Adequacy Standards. These data, along with other data from 1980, 1981, 1982, 1991, 1992, and 1993 are presented in Appendix C and Table MFHT-2 of the PAP. Appendix C and Table MFHT-2 do not adequately identify when these data were collected or who collected the data, and although these data provide useful information, they do not meet the requirements of determining seasonal variations of quality and quantity for the purposes of the Coal Mining Rules.

The Permittee initiated a re-evaluation of ground-water resources in 2000, but found inconsistencies between their field observations and the older data. Because of this, the Permittee has placed little confidence in information from the previous surveys. Springs and seep locations were resurveyed, and new baseline data were collected in 2000 and 2001 and correlated with the older data where possible. Collection of baseline data continued through 2002.

The 2000 and 2001 data tabulated in Tables MFHT-3 and MFHT-4 of the PAP indicate that the response of the Mill Fork seeps and springs to seasonal and climatic changes is similar to that of the other seeps and springs on East Mountain, which have been monitored by the Permittee for more than twenty years.

Water-quality descriptions include those parameters required by the Coal Mining Rules: total dissolved solids (TDS) or specific conductance corrected to 25°C, pH, total iron, and total manganese. In addition, baseline and operational parameters have been determined for the samples submitted for laboratory analysis: these parameters correspond with those in DOGM directive Tech 004.

Monitoring parameters include approximate rates of discharge from the seeps and springs. Usage is given in the water-rights printouts in Appendix C and locations of the water rights are shown on Drawing MFS1832D- Water Rights of the PAP.

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The Permittee states that extensive research has established that the surface- and ground-water systems are not hydraulically connected, so no impacts to surface waters are anticipated from dewatering of perched systems in the coal seams and adjacent strata (PAP, section R645-301-624). Much of the information from this research is summarized in Appendix B, *Surface-water and ground-water investigation of the Mill Fork Lease area, Emery County, Utah*, by Mayo and Associates, October 24, 2001 (PAP, section R645-301-700, Appendix B). This lack of interconnectivity does not apply to impacts to surface or ground water due to subsidence, nor where fractures link the surface and subsurface systems.

Table TM-1 – Baseline for Operational Monitoring Springs												
Spring Water Right	1982	1993	1994	1995	1996	2000 3 rd Qtr	2000 4 th Qtr	2001 2 nd Qtr	2001 3rd Qtr	2001 4th Qtr	2002 July	2002 Oct.
EM-216 93-3399			field				field					
EM POND							field, lab		field, lab		field, lab	field, lab
Grants Spring Added at request of USFS												
Little Bear Spring 93-1411	lab (CVSSD)	lab (CVSSD)	lab (CVSSD)	lab (CVSSD)	lab (CVSSD)		lab (CVSSD)			lab (CVSSD)		
JV-9						field, lab		field, lab		field, lab	field, lab	field, lab
JV-34							field, lab	field, lab		field, lab		
MF-7		field	field		field	field, lab		field, lab		field, lab	field, lab	field, lab
MF-10 93-1412		field	field	field	field		field, lab		field, lab		field, lab	field, lab
MF-19B (18A) 93-1413			field	field	field	field, (lab)			(lab)		field, lab	
MF-213 93-259	field					field, lab		field, lab		field, lab	field, lab	field, lab
MF-219 93-1410						field		field, lab		field, lab	field, lab	field, lab
MFR-10								field, lab		field, lab	field, lab	field, lab
MFR-30								field, lab		field	seep	dry
RR-5			field		field	field					field, lab	
RR-15			field	field	field		field, lab		field, lab	field, lab	field, lab	field, lab
RR-23A				field	field		field, lab			field, lab	field, lab	field, lab
SP1-26 SP-1-26							field, lab		field, lab	field, lab	field, lab	field, lab
SP1-29									field, lab	field	field, lab	field, lab
UJV-101		field		field	field		field, lab			field, lab		
UJV-206 93-3400					field	field, lab		field, lab		field, lab	field, lab	field, lab

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Table TM-2 – Baseline Monitoring of Springs with Water Rights Based on Table MFHT-2 of the PAP (M) = Proposed for Operational Monitoring												
Spring Water Right	1982	1993	1994	1995	1996	2000 3 rd Qtr	2000 4 th Qtr	2001 2 nd Qtr	2001 3 rd Qtr	2001 4 th Qtr	2002 July	2002 Oct.
EM-216 (M) 93-3399			field			field						
JV-26 93-998												
JV-36 a23164												
JV-43 93-1572												
MF-10 (M) 93-1412		field	field	field	field		field, lab		field, lab	field, lab		
MF-19B (M) 93-1413			field	field	field	field					field, lab	
MF-213 (M) 93-259	field					field, lab		field, lab		field, lab	field, lab	field, lab
RR-5 (M) 93-1571			field		field	field						
RR-14A 93-1414			field	field	field							
SP1-26 (M) 93-1410							field, lab		field, lab	field, lab	field, lab	field, lab
UJV-204 93-102		field	field	field	field							
UJV-206 (M) A23166					field	field, lab		field, lab		field, lab	field, lab	field, lab
UJV-207 93-821		field	field	field	field	field, lab		field, lab				
UJV-209A 93-1254			field	field	field	field, lab		field, lab				
UJV-213 a21560												
UJV-214 93-3400												
Little Bear Spring (M) 93-1411	lab (CVSSD)	lab (CVSSD)	lab (CVSSD)	lab (CVSSD)	lab (CVSSD)		lab (CVSSD)			lab (CVSSD)		

Little Bear Spring

Little Bear Spring in Little Bear Canyon, east of the Mill Fork Lease, is an important source of water for the Castle Valley Special Services District (CVSSD), supplying 65 percent of the culinary water to the residents of Huntington, Cleveland, and Elmo. The only treatment required before use is chlorination. It is probably the largest and most consistently flowing spring in the region.

Little Bear Spring flows from the bounding fault zone on the west side of the Mill Fork Graben. Isotope analyses, geophysical investigations, dye-tracer tests, and comparisons of flow in Mill Fork with other Huntington Creek tributaries indicate that the ultimate recharge area for

Little Bear Spring is upper Mill Fork Canyon. Precipitation runoff, snowmelt, and discharge from numerous springs collect in both the channel and alluvium of Mill Fork, and the water is diverted to Little Bear Spring through the Mill Fork Graben (PAP, section R645-301-721, A. 15. b. (1)). An additional stream-monitoring point has been added upstream of the Mill Fork Graben at the request of the USFS. The proposed location is shown on Drawing MFS1851D.

When operations in the Trail Mountain Mine exposed the Spring Canyon Member in the down-plunge end of the Straight Canyon Syncline, ground water under pressure entered the mine at a rate of 200 to 300 gpm until the Spring Canyon Member was depressurized (PAP, section R645-301-700, Appendix B, page 72). Although recharge to Little Bear Spring from the Star Point Sandstone and Blackhawk Formation is generally discounted in the PAP because of low permeabilities, the down-plunge end of the Crandall Canyon Syncline intercepts the Mill Fork Graben between Mill Fork and Little Bear Canyons and may provide part of the recharge to Little Bear Spring. The possibility exists that mining in the Mill Fork tract could depressurize the water in this syncline and impact some portion of the flow at Little Bear Spring; however, exploration bore-holes along the trough of the Crandall Canyon Syncline did not have measurable ground-water inflow from the Blackhawk Formation and Star Point Sandstone.

Baseline data have not been collected by the Permittee, but CVSSD has measured flow since 1982 and documented quality for a number of years. Flow varies seasonally, one indication of a shallowly circulating ground-water system, but minimum flows have not dropped below approximately 200 gpm, indicating there is also storage capacity in the ground-water system: much of this storage is probably in the channel-bottom alluvium of Mill Fork Canyon. Average flow has been approximately 340 gpm. Isotopes indicate modern water, and quality is similar to surface waters in Huntington and Little Bear Creeks (PAP, section R645-301-721, A. 15. b.). Baseline water-quality and -quantity data from CVSSD for Little Bear Spring have been included in Appendix C, and Little Bear Spring has been added to the monitoring plan.

The Huntington #4 Mine crossed the Mill Fork Graben. Offset on the bounding faults on both sides is approximately 25 to 30 feet (PAP, section R645-301-721, A. 3. g.). Within the graben and at the bounding faults, only minor amounts of ground water were encountered in the mine, and flow at Little Bear Spring was not measurably impacted (PAP, section R645-301-721, A. 15. b.). Either the mine is above the potentiometric surface or there is an aquitard – perhaps one of the coal seams – isolating the mine from the water.

Joes Valley Fault.

Three samples of water associated with the fault were collected in the Crandall Canyon Mine, and radiocarbon age and tritium content were measured. There was a minor amount of tritium in one sample, indicating some recharge of modern water, but radiocarbon dating indicated all three samples were 2,500 to 5,000 years old (PAP, section R645-301-700, Appendix B, page 78). Drill-holes adjacent to the fault indicated limited lateral hydrologic communication. Mining within 200 to 300 feet of the Joes Valley Fault could intercept modern

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water, recharged from the surface, but the “active” zone near the fault may include deeper, older water. A stipulation in the coal lease does not allow full extraction-mining within a 22 degree angle-of-draw of the fault (PAP, section R645-301-728, I. 4. a. (2); and Appendix B, page 126).

Joes Valley Fault separates Joes Valley from East Mountain and the Mill Fork Lease. This fault runs generally north-south. It is a normal fault with up to 2,300 feet of vertical offset, downthrown on the west side: the PAP gives the offset as 1,500 feet adjacent to the Mill Fork Lease (PAP, section R645-301-721, A. 3. g.). The fault forms the eastern edge of Joes Valley Graben and the steep escarpment along the western flank of East Mountain. (The fault and graben are regional features that extend both south and north of the East Mountain area.) North Horn and Upper Price River Formations are exposed on the floor of Joes Valley, with thick alluvium and colluvium deposits overlying these formations adjacent to the fault and escarpment. Most of the springs in Joes Valley flow from the alluvium along Indian Creek or from the North Horn Formation exposed west of the creek. Springs also flow in the small canyons that have been eroded into the fault scarp: these springs appear to be less numerous in the northern part of the Mill Fork tract where the fault and the mountain ridge are close to each other, and to become more numerous towards the south as the distance between the scarp and ridge increases (PAP, Plate 1 and Drawing MFU1823D).

Surface Water Information

Crandall Canyon, Rilda Canyon, Mill Fork, Little Bear, and Indian Creek are the main surface drainages in and adjacent to the Mill Fork Lease area. A number of small unnamed tributaries to Indian Creek flow from the west side of East Mountain. Crandall, Little Bear, and Indian Creeks are perennial, but Little Bear Canyon has a small surface area and is perennial mainly because of Little Bear Spring. Crandall, Rilda, Little Bear, and Mill Fork are tributary to Huntington Creek; Indian Creek is tributary to Cottonwood Creek by way of Lowry Water. The USFS excluded Little Bear Canyon from the Mill Fork Lease to protect Little Bear Spring.

Crandall Creek has been monitored for a number of years by Genwall Resources. The Applicant will not monitor this stream unless Genwall terminates monitoring (PAP, section R645-301-721, B. 1. b. 1. (b)).

Rilda Canyon has been monitored downstream of the Mill Fork Lease since 1989. Baseline quality analysis monitoring was done in 1989-1990, and is to be repeated every five years (PAP, section R645-301-721, B. 1. b. 1. (d)).

Streamflow in Little Bear Canyon is not monitored, but Little Bear Spring is closely monitored by CVSSD. This spring has been added to the monitoring plan in Appendix A of Volume 9.

Baseline and operational data have been collected since 1997 at MFA01 and MFB02 in Mill Fork. Locations are shown on Drawing MFS1851D – Hydrologic Monitoring Map. Data

for Mill Fork have been submitted with Energy West's quarterly reports since 1997. Flows have been monitored monthly since January 1997, but it is common for these monitoring sites to have no flow. Laboratory reports for 1997 through 2001 are in Appendix C, and information on flow, pH, conductivity, and dissolved oxygen is summarized. Parameters from DOGM directive Tech 004 have been determined for the samples submitted for laboratory analysis. Only one baseline analyses was done at MFA1 (June 1999) and this site was either dry or inaccessible due to snow the rest of the 1998 through 2002. Baseline quality analyses were done November 1998, June 1999, September 2000, and September 2001 at MFB2, but for unexplained reasons, only operational parameters were done December 1998 and September 1999: this site was dry or frozen during monthly visits in 2002. Baseline analyses will be repeated every five years (PAP, section R645-301-721, B. 1. b. 1. (c)). Based on a request from the USFS, an additional monitoring site, MFU-03, was added upstream of the Mill Fork Graben in 2002; the location is on Map MFS1851D.

Indian Creek was monitored for baseline parameters in 2000 and 2001. Flow and water-quality parameters will be measured during baseflow conditions at ICA, ICB, ICF, and ICD (PAP, section R645-301-721, B. 1. b. 2. (b)). These sites are marked on Map MFS1851D. Water-quality data for October 2000 and 2001 are in Appendix C of section R645-301-600 of the PAP. Genwal has monitored flow and water-quality at ICF since 1996, and the data have been incorporated into the Permittee's hydrologic database. The Permittee will continue with operational monitoring during baseflow only at ICA, ICB, and ICD, but Genwal is currently committed to continue monitoring at ICF. (The ICF flume has a continuous recorder but because of poor access it is typically operational only from June through October; however, water samples are collected quarterly when the site is accessible.)

There are no known water-supply intakes for current users of surface waters flowing into, out of, and within the Mill Fork Lease hydrologic area (although the creek in Mill Fork Canyon is a source of recharge to Little Bear Spring). The water supply system in Rilda Canyon is shown on maps and drawings in the existing Deer Creek Mine MRP.

There is no surface disturbance planned for the Mill Fork Extension, and no surface waters will receive discharges from affected areas in the proposed Mill Fork Lease area. Locations for Deer Creek Mine UPDES discharge points are shown on maps in the existing MRP.

Names and locations of surface water bodies within the proposed Mill Fork Lease permit and adjacent areas are shown on several maps in the PAP, including Plate 1; Drawing MFS1830D – Hydrologic Map; and Drawing MFS1839D - Pre-subsidence Survey Map. Water rights are listed in water-rights printouts in Appendix C and locations are shown on Drawing MFS1832D - Water Rights of the PAP. Surface-water bodies are described in R645-301-721, B.

Information from ICA, ICB, and ICD in the Mill Fork Lease PAP, when combined with data from ICF, is sufficient to demonstrate seasonal variations of flow and water quality.

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Water-quality descriptions include baseline information on total suspended solids, total dissolved solids or specific conductance corrected to 25° C, pH, total iron, and total manganese. In addition, baseline and operational parameters from DOGM directive Tech 004 have been determined for the samples submitted for laboratory analysis.

There will be no new mine openings under the Mill Fork Lease extension and no potential for acid drainage from the proposed mining operation in the Mill Fork Lease area. Nevertheless, the Applicant has included information on baseline acidity and alkalinity in the ground-water quality analyses.

Streams in Mill Fork and Crandall Canyons flow from spring snowmelt and heavy thundershowers. In addition to the seasonal surface flow, alluvium transports a significant amount of water throughout the year. After surface runoff has ceased, water from the alluvium may surface over short reaches of the streambed and then percolate into the alluvium again as it continues its flow down the canyon (PAP, section R645-301-624).

Baseline Cumulative Impact Area Information

The Mill Fork Lease is in the cumulative impact area (CIA) for the East Mountain Cumulative Hydrologic Impact Assessment (CHIA) prepared by the Division in 1994. An updated CHIA has been prepared.

Mining in the Mill Fork Extension will be done beneath the Mill Fork, Rilda Canyon, and Indian Creek watersheds and a small part of the Crandall Canyon drainage. The Mill Fork Lease area lies between Joes Valley Fault and the Mill Fork graben. The Joes Valley Fault is especially important as it is a subsurface hydrologic barrier between the mine and Joes Valley. Shallow alluvial ground water flows down the canyons that descend from East Mountain to Joes Valley and then flows into Joes Valley through the alluvial fans that have been deposited across the fault (PAP, section R645-301-624, p. 6-18).

Although the areas of impact will shift within the CIA, there should be no change to cumulative impacts outside the CIA. The main hydrologic impact will be removal of water from storage in the Blackhawk Formation and Star Point Sandstone, which will have no impact on the hydrologic balance outside the CIA. The quantity of discharges from the mine to surface waters should continue at rates similar to those from other recent mine operations, and water quality of the discharges should also be similar, so surface water will not be further impacted or materially damaged.

Hydrological Reports

Hydrologic and geologic information for the cumulative impact area have been obtained by the Division from federal or state agencies. Additional information has been included with the PAP. The Crandall Canyon Mine has provided other information.

Probable Hydrologic Consequences Determination

A Probable Hydrologic Consequences report was compiled by Mayo and Associates for Energy West. The report is submitted in Appendix B of section R645-301-700 of the PAP. The geologic information presented in the PAP is sufficient to establish the hydrologic activities and functions for a probable hydrologic consequence determination.

The planned subsidence from full-extraction mining should result in a generally uniform lowering of the surface over broad areas, and that will limit the extent of material damage to the surface lands, with no appreciable change to land uses and renewable resources, including seeps, springs, and streams. Studies by PacifiCorp and by the US Bureau of Mines indicate that impacts to perched aquifers are negligible when site-specific conditions include thick overburden and hydrophilic clays (R645-301-728, I. 2.). Experience in the Deer Creek Mine area shows that subsidence occurs within two months of coal extraction, and the land is stable after two years. Predicted subsidence is 0 to 15 feet, based on total cumulative extraction not exceeding 20 feet.

Full-extraction mining will be done beneath the headwaters of Mill Fork, Rilda, and Crandall Canyons, and tributaries to Indian Creek on East Mountain. There will be no full-extraction mining beneath and no subsidence of the perennial stream-reaches in those canyons. The PAP discusses the PHC in section R645-728 (pages 79 – 97) and in Appendix B.

The Coal Mining Rules require the permit application to contain a determination of the PHC of the proposed coal mining and reclamation operation upon the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas. Complete and adequate seasonal baseline data, upon which the PHC is to be based, are not in the PAP. Nevertheless, the determination of the PHC on pages 123 – 130 of Appendix B includes findings - based upon the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas - on:

1. *Whether adverse impacts may occur to the hydrologic balance;*
 - a. Mining in the current Energy West permit areas has not affected surface- and ground-water flows.
 - i. Most springs identified in the Deer Creek Mine and Mill Fork Lease areas occur in the Price River, North Horn, and Flagstaff formations;
 1. The layout of the past and future mines is designed to minimize subsidence impacts to the steep cliffs of the Castlegate Sandstone.
 2. Nearly all observed subsidence has occurred in the Price River, North Horn, and Flagstaff formations that overlie the Castlegate.

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3. Springs in the Price River, North Horn, and Flagstaff formations are isolated from subsidence related fracturing because of:
 - a. The thickness of overburden; and
 - b. Clayey units that deform plastically and swell when wetted.
4. Numerous springs have been undermined on East and Trail Mountains, and those that are on areas that have subsided show no evidence of discharge declines attributable to subsidence or fracturing.
- ii. Ephemeral and intermittent reaches of Deer Creek and Grimes Wash have been subsided, with no discharge declines attributable to mining-induced subsidence.
- iii. Waters encountered underground by mining are from strata immediately above and below the mined horizon and from faults.
 1. Waters in strata above the coal are from isolated, inactive systems that are not in connection with the near-surface spring waters.
 2. Inflows into the Deer Creek and Crandall Canyon Mines have occurred from faults.
 - a. In general, these waters do not appear to be tied to modern, active ground-water systems; however
 - b. Tritium data indicate that some ground-water inflows from these faults are local and in hydraulic communication with modern near-surface water.
 3. In the Straight Canyon Syncline, substantial volumes of ground water have flowed into the Deer Creek Mine from the underlying Star Point Sandstone.
- b. By analogy with currently mined areas:
 - i. Reduction of surface-water flows in Mill Fork, Crandall, and Rilda Canyons is not anticipated.
 - ii. The potential for adverse effects to headwater reaches of Mill Fork that overlie planned full-extraction mining areas is minimal because these channel reaches are separated from the coal by the thick sequence of low-permeability North Horn and Price River Formations.
 - iii. The Mill Fork Lease area has no structure analogous to the Straight Canyon Syncline, so inflows to the mine from the underlying Star Point Sandstone are not anticipated.
 - iv. Mining within 200 to 300 feet of the Joes Valley Fault system could intercept appreciable quantities of modern near-surface water.
- c. The potential for adverse impacts to Little Bear Spring is small because:

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- i. It is 1.5 miles from the lease boundary and 2 miles from the nearest proposed mining; and
 - ii. It discharges from an active ground-water system that is in good communication with shallow recharge sources.
 - 2. *Whether acid-forming or toxic-forming materials are present that could result in the contamination of surface- or ground-water supplies;*
 - a. Pyrite has been identified in the PacifiCorp mines.
 - i. The pyrite oxidizes to produce acid.
 - ii. Acidic waters and iron have not been observed in the PacifiCorp mines.
 - 1. Acid produced by pyrite oxidation is quickly neutralized by naturally occurring carbonate minerals.
 - 2. Iron is precipitated as iron hydroxide.
 - b. No other acid-forming material than pyrite and no toxic-forming materials have been found or are suspected to exist in strata to be disturbed by mining.
 - c. Extensive testing of overburden strata, coal, and surrounding rocks has shown that there are no potentially acid- and toxic-forming materials (R645-301-623.100). Details of yearly analyses (1993 to 1999) of coal, floor, and roof are in R645-301-600-Geology - Appendix C of the Mill Fork Lease PAP. Analyses of overburden material are presented in Table G-1 in Volume 8 of the Deer Creek, Des-Bee-Dove, Cottonwood-Wilberg MRP, and summarized in Appendix A of the Mill Fork Lease PAP.
- 3. *What impact the proposed coal mining and reclamation operation will have on:*
 - a. *sediment yield from the disturbed area;*
 - i. Sediment yield from disturbed surface areas is minimized by sediment control structures;
 - ii. Sediment in mine discharge water is minimized by sedimentation ponds;
 - iii. Subsidence can increase or decrease sediment load in streams;
 - 1. Increased stream gradient;
 - a. Higher flow velocities;
 - b. Greater sediment entrainment.
 - c. Extent this will occur in the Mill Fork Lease area is not known, but this is typically local and short-lived.
 - 2. Decreased stream gradient, stream impoundment;
 - a. Sediment deposited in the impoundment;
 - b. Extent this will occur in the Mill Fork Lease area is not known, but this is typically local and short-lived.
 - b. *acidity, total suspended and dissolved solids and other important water quality parameters of local impact;*

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- i. Most springs occur in strata above the coal seam and mine, so a mechanism for impact is unlikely.
 - ii. Past monitoring at the Deer Creek, Des-Bee-Dove, Cottonwood-Wilberg Mines has detected no impacts to quality of water in springs and streams.
 - iii. Water discharged from the Mill Fork Lease will be subject to UPDES standards.
 - iv. Water discharged should be similar to that discharged from the Deer Creek and Cottonwood-Wilberg Mines, which:
 - 1. Meets secondary drinking water quality standards, and
 - 2. Has not had identifiable detrimental impacts on the quality of water in the receiving streams
 - c. *flooding or streamflow alteration;*
 - i. Expected discharge, although impossible to predict, will probably be much less than the maximum runoff during spring snowmelt or summer thundershowers;
 - ii. Flooding and streamflow alteration are not expected from mine discharge waters.
 - d. *ground-water and surface-water availability;*
 - i. Mining will not significantly affect availability of ground water
 - 1. Ground water in the Blackhawk is compartmentalized and the formation is not a hydraulically continuous aquifer
 - 2. Ground water in the Blackhawk is isolated from overlying, modern ground waters;
 - 3. Local effects of dewatering will have no effects on the ground-water availability in the surrounding region.
 - ii. No water supplies will be impacted by removal of water from strata immediately above and below the coal seams.
 - e. *other characteristics as required by the Division;* The Division has required the evaluation of no other characteristics.
4. *Whether the UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES conducted after October 24, 1992 may result in contamination, diminution or interruption of State-appropriated Water in existence within the proposed permit or adjacent areas at the time the application is submitted.*
- a. There are no ground-water supply wells in the Mill Fork Lease area.

No water supplies will be impacted by removal of water from strata immediately above and below the coal seams.

Drawing MFU1823D, the surface geology map, shows the Crandall Canyon Syncline passing right through the heart of the projected Mill Fork Lease mine workings, and it intercepts the Mill Fork Graben just upgradient of Little Bear Spring. The Crandall Canyon Syncline, and the potential that mining in this syncline will impact the hydrologic balance in and adjacent to

the Mill Fork Lease, Little Bear Spring in particular, are discussed in the PHC in section R645-301-728, I. 1.

The Permittee has discussed the expected duration of flow and the volume of water expected to be encountered in section R645-301-728. I. 4. c. Additional information is provided in R645-301-721, A. 9. and R645-301-721, A. 10. Discharge is expected to be similar to that in the Deer Creek Mine and adjacent Crandall Canyon Mine, but discharge per acre mined is not estimated because interception of water varies depending on several factors, and flow from any given area is expected to decline rapidly after the initial encounter and to decrease over time.

Findings:

Hydrologic Resource Information is not considered adequate to meet the requirements of this section. Prior to approval the Applicant must provide the following information for the Mill Fork Lease PAP in accordance with:

R645-301-525.480, -731.530, (1) Clarify whether the first part of the paragraph of section 731.530 is merely a verbatim restatement of Coal Mining Rule R645-301-731.50 or is a commitment from the Permittee to comply with that rule; **(2)** In section 731.530, the word “potential” needs to be removed from the next-to-last sentence - “In addition, Table MFHT-2 list the quantity of the water rights within the projected area, and observed flows collected during the baseline surveys and potential mitigation alternatives.”: these are not “potential” alternatives, these will be “the” alternatives, the core of the Permittee's water-replacement plan. The Permittee will be expected to be prepared to implement, if necessary, one or more of the listed Mitigation Alternatives (mitigation methods not listed might be acceptable but would need to be agreed to by the Division and the owner of the affected water right); and **(3)** The water replacement information in section 731.530 and Table MFHT-2 needs to be linked to Coal Mining Rule R645-301-525.480 in the engineering section, the rule that requires description of the measures to be taken to replace adversely affected State-appropriated water.

RECOMMENDATIONS:

The proposed Mill Fork Extension amendment should not be approved at this time. Several deficiencies need to be adequately addressed before this amendment can be approved.